



#### **Sixth Annual ITS America Meeting**

April 15 - 18, 1996

George R. Brown Conference Center  
Houston, Texas

## **International ITS Information Clearinghouse Fact Sheet #7**

### **Measured Benefits of Deployed ITS Technologies**

The deployment of Intelligent Transportation Systems technologies has resulted in benefits that have been evaluated and measured. The results have shown improved safety and productivity along with a reduction in congestion and adverse environmental impacts.

### **Advanced Traffic Management Systems**

#### **1) Oakland County, Michigan - FAST-TRAC**

FAST-TRAC is one of the largest ITS projects. It is a public/private partnership encompassing:

- Computer Controlled Adaptive Signal Control System for the control of traffic signals at intersections based on real-time traffic densities.
- Automated Traffic Monitoring System using video detection devices to provide data on traffic density.
- Beacon based dynamic route guidance system providing real-time information to motorists on the best route to use and how to get there based on current traffic conditions.
- A Comprehensive Intermodal Transportation Information Management System for processing transportation data into information for dissemination to users over a variety of media.
- Integration of ATMS/ATIS.
- Integration of ATMS/APTS.
- Integrated Corridor Traffic Management.

#### **Results**

##### **Safety:**

- ▼ 89 percent decrease in left-turn accidents intersections.
- ▼ 6 percent decrease in injury accidents.
- ▼ 27 percent decrease in total injuries.
- ▼ 100 percent decrease in serious injuries.

##### **Congestion:**

- ▼ Up to 19 percent increase in vehicle speeds during peak hour.

#### **2) Minneapolis, Minnesota**

The Minnesota Department of Transportation (Mn/DOT) Traffic Management Center (TMC) is a real-time adaptive freeway control system that meters traffic onto the freeways based on the density and speed of traffic.

#### **Results:**

##### **Safety:**

- ▼ Accident rates decrease by 25 percent (421/year to 308/year).
- ▼ 20-minute reduction in response time to incidents.

##### **Congestion:**

- ▼ Average speeds increase by 35 percent (34 mph to 46 mph) during rush hours.
- ▼ Capacity of Freeway increased by 22 percent.

### **3) Abilene, Texas**

As part of the Texas DOT program, computerized traffic signals were installed in Abilene to time traffic signals based on traffic density.

#### **Results:**

##### **Congestion:**

- ▼ 4 percent reduction in travel time,
- ▼ 37 percent reduction in delays,
- ▼ 22 percent increase in travel speed.

##### **Air Pollution:**

- ▼ 10 percent reduction in carbon monoxide and hydrocarbon emissions.

## **Advanced Traveler Information Systems**

### **1) Orlando, Florida - TRAV-TEK**

A large public/private partnership program to test an Advanced Traveler Information System. The program involved 5 organizations, 100 vehicles, most of which were AVIS rental cars, and 4,000 drivers over an extended period of time. Vehicles had electronic route guidance systems installed.

Provides detailed directions to drivers who input destination information, and GPS data on real-time location of the vehicle. The system was connected to a Traffic Control Center via satellite.

#### **Results:**

##### **Congestion:**

- ▼ 9 percent reduction in travel time.

## **Electronic Toll And Traffic Management**

### **1) Oklahoma Turnpike Authority - PIKEPASS**

Electronic toll collection systems have been operational for several years and are currently being installed in 20 states. Electronic toll technology uses a special RF (Radio Frequency) tag that talks to the toll gate as the vehicle approaches. The tag identifies the driver and the toll system then debits the driver's account for the amount of the toll. The vehicle does not need to slow down at all, and proceeds through the toll plaza at regular freeway speeds, eliminating the slowdown and deceleration at toll booths.

#### **Results:**

##### **Safety:**

- ▼ Reduced accidents to zero in first year (eg 71 accidents in regular toll lane, zero in PIKEPASS lane).

##### **Congestion:**

- ▼ Reduced time lost to toll congestion by 1 million hours/year.

##### **Productivity:**

- ▼ Reduced annual cost of operation of toll lane by 11 to 1 (\$176,000 to \$15,800).

##### **Air Pollution:**

- ▼ Reduced air pollutants:
  - Hydrocarbons by 6 to 1,
  - Carbon Monoxide by 4 to 1.

## **Advanced Public Transit Systems**

### *Automatic Vehicle Location / Computer-Aided Dispatch*

Twenty-one cities in the United States have or are in the process of installing AVL/CAD (Automatic Vehicle Location / Computer-Aided Dispatch) systems on their buses. AVL/CAD provides precise position of the bus along its route and reports this to the central computer at dispatch headquarters. This data is used to determine the on-time performance and provides the driver and the dispatcher with a visual indication of where the bus is (if desired) and schedule adherence (ahead of schedule or behind schedule.) The systems also provide accurate run times on routes and a covert "mayday" message capability. AVL is also the basic ingredient for providing real-time schedule information to the public to make transit easier to use and more reliable.

#### **1) Baltimore MTA, Maryland**

Baltimore installed a system on 50 buses in 1991 and conducted a schedule performance test versus non-equipped buses. They are in the process of installing AVL on the remainder of their 850 buses.

##### **Results:**

###### **Productivity:**

- ▼ Achieved a 23 percent improvement in on-time performance by the AVL-equipped buses.

#### **2) Kansas City, Missouri - Kansas City Area Transportation Authority**

Kansas City installed a system in 1991 on 200 buses. As a result of improving schedule adherence and accurate run times, Kansas City was able to utilize 7 fewer buses to operate its routes.

##### **Results:**

###### **Productivity:**

- ▼ Operating expense savings:\$400,000/year.

###### **Capitol for Buses:**

- ▼ \$1,575,000.
- ▼ Amortized Investment in less than 3 years

###### **Safety:**

- ▼ Reduced time to respond to an incident (medical, criminal, etc.) from 3 to 10 minutes to 1 minute by always being able to pinpoint the location of buses.

#### **3) Toronto, Canada**

Toronto has had an AVL system operating for several years.

##### **Results:**

###### **Productivity:**

- ▼ Achieved a 4 percent reduction in the number of buses required to serve existing routes.
- ▼ Amortized investment in 2 years.

## **Commercial Vehicle Operations**

### ***1) A Large Trucking Company***

A trucking company installed an on-board computer and communication system on its trucks. This is connected to a Computer-Aided Dispatch system at dispatch headquarters. The system allowed the company to better utilize the fleet of 10,000 trucks by an average 20-25 miles per day per truck. This is significant in an industry that operates on a low margin.

### ***Results:***

#### **Productivity:**

- ▼ An increase of 4 percent in fleet productivity.

*Compiled by William S. Jones, consultant to ITS America.*

### **References:**

1. "IVHS on the FAST-TRAC," John L. Grubba and James C. Barbaresso; IVHS Review, Summer, 1994.
2. Mn/DOT Freeway Operations Program Status Report, October, 1994.
3. Information provided by Jon Krieg, City of Abilene, TX.
4. "Results of the Trav-Tek System Evaluation," Joseph L. Peters and Frank J. Mammano; Proceedings of the First World Congress on Applications of Transport Telematics and IVHS.
5. VORAD Collision Warning Radar, J.D. Walk, VORAD Safety Systems, Inc., IEEE International Radar Conference, May 8-10, 1994.
6. Oklahoma Turnpike Authority - Pike Pass Facts and Action, report by John Scott, 12-27-93.
7. AVL On Time Performance, Baltimore MTA by David Hill, 4-14-93.
8. Interview with Delores Brehm, Superintendent of Schedules, Kansas City Area Transportation Authority, January, 1995 and "ITS Technology in Public Transit - Deployment and Benefits," ITS America report by W.S. Jones, 2-27-95.
9. Interview with N. Melnyck, Manager, Corporate Planning, Toronto Transit Commission, December, 1994.
10. Confidential source.

*March 7, 1995*

#### ***Contact:***

*Steve Hay*

*Phone: (202) 484-4665*

*e-mail: shay@spaceworks.com*



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## **International ITS Information Clearinghouse Fact Sheet #8**

The National Automated Highway System Consortium

Revised 8/15/95

### ***Mission Statement:***

The National Automated Highway System Consortium (NAHSC) mission is to specify, develop and demonstrate a prototype automated highway system (AHS) by the year 2002. The prototype AHS will provide fully automatic vehicle operation in dedicated lanes to make travel safer and more efficient, improve the mobility of people and goods, increase the productivity of surface transportation and contribute to a better quality of life. It will facilitate intermodal travel while accommodating transit, commercial and private vehicles, and contribute to a better environment.

The AHS specifications will provide for progressive deployment tailored to meet regional and local transportation needs. The Consortium will seek opportunities for spin-off vehicle and highway automation technologies to achieve early benefits for all users of the U.S. surface transportation system.

The Consortium is committed to achieving a national consensus on major AHS decisions by engaging public and private stakeholders in the definition, development and evaluation of an automated highway system that is technically, economically and socially viable.

### ***Core Participants:***

- Bechtel Corp.
- Caltrans (California Department of Transportation)
- Carnegie Mellon University
- Delco Electronics Corp.
- General Motors Corp.
- Hughes Aircraft Co.
- Lockheed Martin
- Parsons Brinckerhoff
- The University of California Partnership for  
Advanced Transit and Highways (PATH)

### **Project**

#### ***Significant Milestones:***

- Demonstration of technology in 1996.
- Automated system demonstration on a test track in 1997.
- Demonstration of a prototype system in 2002.

### ***Short-term Events:***

A workshop presenting and soliciting feedback on the NAHSC Program Plan: AHS System Requirements; '97 Demonstration Plan and Concept Development and Downselection will be held in San Diego at the Sheraton Inn - Central on October 18 - 20, 1995. To register contact Jo Ann Breckenridge at (303) 977-5761.

### ***Associate Participants (to date):***

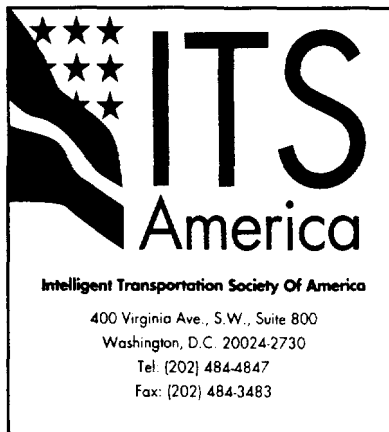
- Virginia Polytechnic Institute and State University (Virginia Tech) Center for Transportation Research, Blacksburg, VA.
- The Ohio State University Center of Intelligent Transportation Research, Columbus.
- Creative Transit Alternatives, Falls Church, VA.
- State University of New York at Stony Brook Department of Electrical Engineering.
- Robotic Technology Inc., Potomac, MD.
- BRW, Inc., Phoenix, AZ.
- CCG Associates, Inc., Silver Spring, MD.
- Wilbur Smith Associates, Columbia, SC.
- Daniel Consultants, Inc., Columbia, MD.
- Oakland University, Rochester, MI.
- ITS America, Washington, D.C.

#### *Contact:*

*Celeste Speier, Public Relations*

*NAHSC*

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## The International ITS Clearinghouse Fact Sheet #9

### Traffic Information on the World Wide Web

Pre-Trip Travel Information systems are intended to allow travelers to access a range of multimodal transportation information at home, work, and other major sites where trips originate. These systems may include information on transit routes, schedules, transfers, and fares; intermodal connections to rail or other transportation systems; access to ridematching services; updates of traffic and highway conditions; real-time information on incidents, accidents, road construction, alternate routes, traffic regulations and tolls; measured and predicted congestion and traffic speeds along specific routes; parking conditions and fees; availability of park-and-ride facilities; tolls; special event information; and weather information.

As envisioned in the National ITS Program Plan, Pre-Trip Travel Information systems will become a part of wider information services that appeal to a range of consumer needs in addition to transportation. As services such as interactive television and the National Information Infrastructure (specifically, the Internet) evolve, Pre-Trip Travel Information systems will complement other home information networks such as home shopping, banking or educational services. This Fact Sheet lists a sample of the traffic information services available on the World Wide Web (WWW). Because of the way the WWW is structured (users can move around various Web sites using pre-established links) the information described here may be accessed from a large number of web pages. Whenever possible, originating addresses are noted here.

#### 1.0 Southern California Real-time Traffic Reports

The Southern California Area Traffic Report is an experimental public service and joint effort between Maxwell Laboratories and the California State Department of Transportation to provide real-time freeway traffic information to homeward bound commuters in their offices via the Internet. Current information includes traffic reports for San Diego, Los Angeles, and Orange Counties. Users are invited to post information on local traffic conditions in other cities world wide. The page also links user to a wide range of transportation information resources.

**Address:** <http://www.scubed.com/caltrans/transnet.html>

**For information:** S-Cubed, 3398 Carmel Mountain Road  
San Diego, CA 92121-1095

**Phone:** 619-453-0060

**Fax:** 619-0474 or by

**E-mail:** [webmaster@scubed.com](mailto:webmaster@scubed.com)

## **2.0 City of Anaheim Traffic Management System**

The City of Anaheim Traffic Internet Information Server is operational in a beta-test mode (the address of the site is subject to change). It provides traffic speeds and road information for the local Anaheim area and Los Angeles and Orange Counties. The information is updated approximately every 1/2 minute. Detailed maps are provided for the areas immediately adjacent to Disneyland, Orange County Airport, East Anaheim, West Anaheim, and the Stadium area. Users may also access detailed maps of LA county, and LAX and the California Highway Patrol (CHP) Road Conditions Report, Weather Information, and a wide range of other traffic and travel related services. TraView, an application developed by JHK, imports sensor data from Caltrans Districts 7 and 12 and the city's street sensor network, and converts it directly into graphics displayable on a World Wide Web page.

**Address:** Beta test site- <http://www.ci.anaheim.ca.us>

**For information:** Traffic Management Center - James Paral. City of Anaheim  
714-254-5183  
or Mike Kruger, JHK/Anaheim 714-758-0019

## **3.0 Seattle Area Traffic Information:**

Traffic data and a color congestion map for the Seattle Region is updated every 2.5 minutes. The color map rates traffic on major routes as Stop, Heavy, Moderate, or Light. Areas with no sensors are shown in blue; those for which no data are available are shown in gray. Maps are clearly labeled with the time the map was generated and the time at which map data was retrieved from the sensors. The map can be located at the Washington State Department of Transportation Home Page. A Construction Update, using data less than five minutes old, is also available. A software page "Webflow" is available that will allow users to access data directly by clicking on individual section of the roadway.

**Address:** <http://www.wsdot.wa.gov/regions/northwest/nwflow/>

**For information:** Mike Forbis or Mark Butler  
([TRAFFICMASTER@WSDOT.WA.GOV](mailto:TRAFFICMASTER@WSDOT.WA.GOV))

**Phone:** 206-440-4475

**Fax:** 206-440-4804

## **4.0 Houston Area Real-Time Traffic Report**

The Greater Houston Transportation and Emergency Management Center provides real-time traffic conditions information for the Houston region. Probe vehicles are used to estimate travel speeds. Speed ranges are displayed on a color map for I48, SR 59, I 10, I610, Sam Houston, and portions of Highway 6 and FM 1960. Map data is updated approximately once a minute.

**Address:** <http://herman.tamu.houston.real.html>

## **5.0 TRANSCOM Travel Advisory**

The TRANSCOM Travel Advisory includes general travel advisories for major routes in and through New York City, New Jersey, Westchester & Rockland Counties in New York State, Long Island, and Connecticut. General advisories are also provided for area Transit Systems. Information is delivered weekly to subscribers through an E-mail discussion group, however, a number of WWW pages have incorporated these reports. The information included in the TRANSCOM Travel Advisory is primarily special events, construction activities, and other non-recurrent disruptions.

**Mail list address:** i95berniew@aol.com

**For information:** Bernie Wagenblast  
TRANSCOM  
111 Pavonia Avenue  
Jersey City, NJ 07310-1755  
**Phone:** 201-963-4033  
**Fax:** 201-963-7488

### ***Other Interesting Places to Look:***

Transportation Resources- maintained by the Intelligent Transportation Systems Program at Princeton University.

**Address:** <http://dragon.princeton.edu/~dhb/systems.html>

Galaxy Transportation-Engineering and Technology-Transportation.

**Address:** <http://galazy.einet.net/galazy/Engineering-and-Technology/Transportation.html>

### ***Related fact sheets:***

**Fact Sheet #10:** Multimodal Transit Information on the World Wide Web

**Fact Sheet #11:** Traveler Services Information on the World Wide Web

**Fact Sheet #12:** Commuter and Intercity Traveler Information on the World Wide Web

*August 11, 1995*

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## **The International ITS Clearinghouse Fact Sheet #10**

### **Multimodal Transit Information on the World Wide Web**

Pre-trip travel information systems allow travelers to access a range of multimodal transportation information at home, work, and other major sites where trips originate. These systems provide timely information on transit routes, schedules, transfers, and fares; and on intermodal connections to rail or other transportation systems. Pre-trip travel information also includes updates of traffic and highway conditions; real-time information on incidents, accidents, road construction, alternative routes, traffic regulations, tolls, and other information a traveler needs to make mode and route decisions.

The INTERNET and the World Wide Web (WWW) are part of the National Information Infrastructure. The Internet allows computer users across the globe to easily access information on a wide range of subjects. In the past two years, INTERNET and WWW use have skyrocketed as a growing number of home and office users gain access. Consequently, a number of transit service providers have recognized the WWW's potential utility in disseminating pre-trip transit information.

The following list includes a cross-section of examples of how transit can be disseminated on the Internet. Some web sites are sponsored by transit organizations or local governments. In some cases, the information is provided by volunteers. The last three services listed here are an interactive "route finder" services. These services are generally provided for cities with very dense transit networks, providing a number of possible transit routes to a single station or location. The listings below were up to date as of July 25, 1995. See the list of related Fact Sheets at the end of this document.

#### **1. Riderlink:Transportation Options for Central Puget Sound**

Riderlink is a joint project between Metro Transit in King County, Washington and the Overlake TMA. This service provides electronic access to information on bus routes and schedules, rideshare and carpool information, on-line ridematch applications, bicycling information, ferry routes and schedules, and information about employer transportation programs (at kiosk sites only). Riderlink is also accessible at a few kiosks.

**Address:** <http://transit.metrokc.gov/>

**For Information:** Catherine Bradshaw ([catherine.bradshaw@metrokc.gov](mailto:catherine.bradshaw@metrokc.gov))

**Phone:** 206-684-1770

#### **2. San Francisco Bay Area Transit Information**

The Transit Information Project is a public service of Students Improving Campus on-line Services from the University of California at Berkeley. This site includes route, schedule, and fare information for at least twenty transit providers throughout the bay area, as well as transportation related regional information and announcements. Transportation service providers include bus, BART, and ferry services covering most of the San Francisco Bay Area region.



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**Address:** <http://server/berkeley.edu/transit/carriers/>  
**For Information:** Daniel Gildea ([gildea@pasteur.eecs.berkeley.edu](mailto:gildea@pasteur.eecs.berkeley.edu))  
Mikael Sheikh ([sheikh@server.berkeley.edu](mailto:sheikh@server.berkeley.edu))

### **3. Stockholm Subway**

This site provides route and schedule information for the Stockholm Subway System. It also links to the Subway Navigator (described below), which provides route alternatives and travel times.

**Address:** [www.sunet.se/stockholm/sl/sl.html](http://www.sunet.se/stockholm/sl/sl.html)

### **4. The New York City Subway System**

This service is part of a series of pages titled "Paperless Guide to New York City". This page is part of a series of New York City Transit Authority maps for downtown Manhattan, Midtown Manhattan, Upper Manhattan, and North Manhattan. The maps, presented in color, show service times (part-time or full-time), stops and transfer points.

**Address:** <http://www.mediabridge.com/nyc/transportation/subways/picker.html>  
**For Information:** [nyc@mediabridge.com](mailto:nyc@mediabridge.com)

### **5. Welcome to Union Station- The L.A.Rail Transit Web Site**

This page provides route, schedule, and fare information for the growing rail transit network in Los Angeles. It also provides information on AMTRAK lines serving Los Angeles including: The San Diegans, the Coast Starlight, the Dessert Wind, and the Southwest Chief.

**Address:** <http://ucs.usc.edu/~etrinid/larail.html>  
**For Information:** Elson Trinidad ([etrinida@scf.usc.edu](mailto:etrinida@scf.usc.edu))

### **6. Pittsburgh Transit Guide**

The site will route and schedule information for Pittsburgh neighborhoods; as well as general information on Pittsburgh Area Transit (PAT) including riding instructions, fares, and equipment.

**Address:** <http://transit.dementia.org/transit-guide>  
**For Information:** Derrick J. Brashear ([db74+@andrew.cmu.edu](mailto:db74+@andrew.cmu.edu))

### **7. Paris Metro**

Contains full color maps, schedules, and fare information for the Paris Metro, the RER and buses. This page also links to the Subway Navigator (described below), which provides route information. This information is part of an extensive set of files on the Paris area.

**Address:** <http://www.paris.org/metro/>  
**For Information:** Norman Barth ([Norman@ucsd.edu](mailto:Norman@ucsd.edu))

## **8. Delaware Administration for Regional Transit Schedules**

The DART First State Page provides information on regularly scheduled transit services within the state of Delaware. This page includes DART fare, route, and schedule information, and a DART system map.

**Address:** <http://www.dtcc.edu/dart/>

**For Information:** [webmaster@www.dtcc.edu](mailto:webmaster@www.dtcc.edu)

## **9. Transportation in Portland (Oregon)**

This page provides information in public and private transportation alternatives. Transit information is provided for the Tri-Met and MAX Light Rail Services, as well as for the "Fareless Square" area, the Portland Transit Mall, and the Tri-Met Cultural Bus. The page also includes information on taxi and limousine services, biking, car rentals, and Amtrak train service.

**Address:** <http://www.teleport.com/~peekpa/transport.html>

**For Information:** Michael Cox, Peek & Associates, Inc.  
([MCox@AOL.com](mailto:MCox@AOL.com) or [Peekb@teleport.com](mailto:Peekb@teleport.com))

## **10. Subway Navigator**

Finds subway routes and information for approximately 30 cities internationally. Users enter origin and destination stations, and the system provides travel time and transfer instructions. A list of station names is included for most of the cities.

**Address:** <http://metro.jussieu.fr:10001/bin/cities/english>

**For Information:** Pierre David ([Pierre.David@Prism.uvsq.fr](mailto:Pierre.David@Prism.uvsq.fr))

## **11. London - WWW Tube Journey Planner**

This page contains journey planning software which provides travelers with routing operations through the London Underground. Users enter their origin station and destination station, and the system provides route information (including transfer stations). Additional software is available that calculates travel distance.

**Address:** <http://www.cs.ucl.ac.uk/misc/uk/london/tube/index.html>

**For Information:** Martin Smith ([msmith@lssec.bt.co.uk](mailto:msmith@lssec.bt.co.uk))

## **12. New York Street Locator**

This page contains software that provides users with a map from any street address in New York City to/from the closest subway station.

**Address:** <http://www.mediabridge.com/nyc/locator>

**For Information:** Barry Krusch (address available on-line)

### **13. Other Interesting Places to Look for Related Information:**

**Tokyo:** <http://neoteny.eccosys.com>

**Berlin:** <http://www.informatik.hu-berlin.de/Berlin/verkehr> (in German)

**Munich:** <http://www.fast.de/wegbeschreibungE.html> (in English)

**Transit Info:** <http://www.reed.edu/~reyn/transport.html>

**Links to subways and other transportation information:**

<http://www.reed.edu/~reyn/transport.html>

#### ***Related Fact Sheets:***

**Fact Sheet #9:** Traffic Information on the World Wide Web

**Fact Sheet #11:** Traveler Information and Electronic Yellow Pages on the World Wide Web

**Fact Sheet #12:** Commuter and Intercity Rail Information on the World Wide Web

*August 9, 1995*

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# The International ITS Clearinghouse Fact Sheet #11

## Traveler Services Information on the World Wide Web

As envisioned in the National Program Plan for ITS, the Traveler Services Information user service provides the traveler with access to information regarding a variety of travel-related services and facilities. This information, sometimes referred to as "electronic yellow pages" is intended to provide quick access to services in the local vicinity of the traveler. Traveler services information may be accessible to the traveler in the home or office to support pre-trip planning and while en-route, either in a vehicle or at public facilities such as public transit terminals or highway rest stops to help the traveler locate critical local services.

The INTERNET and the World Wide Web (WWW) are part of the National Information Infrastructure. The Internet and WWW allow computer users around the globe to easily access information on a wide range of subjects. In the past two years, INTERNET and WWW usage have skyrocketed, as a growing number of home and office users gain access.

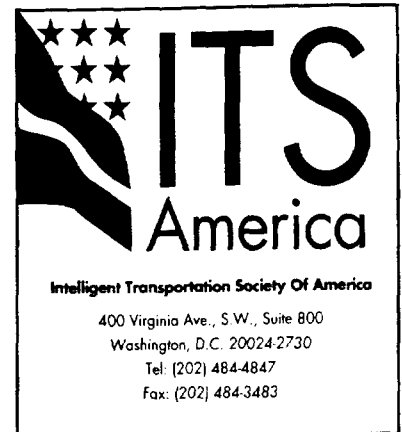
A large number of sites offer traveler services information on the WWW. The following list includes a sample of WWW "pages" that either present this information or organize and link to information provided by others. These web sites are sponsored by a wide range of organizations including Chambers of Commerce, tourist bureaus, state/local governments, and non-profit organizations. In some cases, the information is provided by volunteers. In all cases, the pages link to other pages of interest to their readers. For example, the page for Steamboat Springs Colorado provides information on services available in Steamboat Springs and is also linked to information on weather conditions, ski conditions for the State of Colorado, and road condition information.

The listings below were up to date as of July 25, 1995. See the list of related Fact Sheets at the end of this document. There may be overlap with information provided by the pages listed on Fact Sheets 9, 10, and 12.

### 1. California Yellow Pages - The California Virtual Tourist

This web site focuses on information of interest to tourists and residents in California. The main headings include retail business, internet services, companies, media, and organizations. The retail business yellow pages contains information directly relevant to travelers, including entertainment, shopping, and personal services.

**Address:** <http://www.research.digital.com/src/virtual-tourist/california.html>  
**For Information:** Steve Glassman ([steveg@pa.dec.com](mailto:steveg@pa.dec.com))  
Digital Equipment Corporation



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## **2. The Paperless Guide to New York City**

The Paperless Guide contains a wide range of information of value to travelers and visitors in New York City. Listings include: shopping, dining and restaurants, hotels, museums and other places of interest. The page also links to information on ground, air, and water transportation and provides toll information for most bridges and tunnels.

**Address:** <http://www.mediabridge.com/nyc>

## **3. The PARIS Pages**

The Paris pages provide an extensive range of information to travelers visiting Paris. Information is provided on the public transportation system (Metro/RER/Buses), monuments and museums (including maps, entrance fees, and hours), schools and universities, and other locations of interest. It also links to several journals (including one devoted to the culinary arts), a listing of cafes, special expositions, and a listing of shops and stores.

**Address:** <http://www.paris.org/metro/>

**For Information:** Norman Barth (Norman@ucsd.edu)

## **4. National Parks**

This site provides visitor information for all the National Parks in the United States. Parks can be located by state, region, theme and park name. Information included varies depending on the size and location of the park, but generally includes camping regulations and availability, travel directions, transportation alternatives, services offered, and general park regulations. The HomePage includes a Virtual Visitor Center, which provides a general introduction to the National Parks System.

**Address:** <http://woodstock.rmro.nps.gov/index.html>

## **5. City.Net**

City.Net provides links to information on over 800 communities in 251 countries. Most of the information linked to this page is provided by the cities and countries themselves; City.Net serves as the focal point for potential users. The information available for each location varies, however, most include information on transportation to and within the city, entertainment, hotels and accommodations, parks and sights of interest, local business, and government/community services.

**Address:** <http://www.city.net>

## **6. USA Citilink Project**

Citilink provides links to tourist and travel information for a large number of cities, towns, parks, and entertainment providers in each of the fifty states. As with City.Net, the individual pages are maintained by others. Citilink provides a focal point for users. The information available for each location varies, however, most include information on transportation to and within the city, entertainment, hotels and accommodations, parks and sights of interest, local business, and government/community services. The page for San Diego is a good example ([http://www.nosc.mil/planet\\_earth/sandiego.html](http://www.nosc.mil/planet_earth/sandiego.html))

**Address:** <http://www.NetSoft.com/citylink/>

## **7. Transportation - For the 1996 Olympics in Atlanta**

This page provides transportation information for visitors to Atlanta during the 1996 Olympics. It includes an overview of MARTA, how the transportation system for spectators will work, the cost of Olympic events, service availability, parking (or lack thereof), passenger load factors, disabled access, walking, getting to the Atlanta area, and getting to other venue cities. More specific transportation information (e.g. bus and MART routes and schedules are listed in the general pages for Atlanta.)

**Address:** [www.atlanta.olympic.org/travel\\_info/transport.html](http://www.atlanta.olympic.org/travel_info/transport.html)

### ***I-95-Net (Virtual Interstate)***

This page organizes and presents travel services related information (including lodging, sights to see, activities, travel distances, and food) for cities and counties along the I-95 Corridor.

**Address:** <http://interstatelink.com/isl/i95/i95-us.html>

### ***The Appalachian Trail***

While the Appalachian Trail is intended for foot traffic, it represents an excellent example of how information from a range of states can be organized and presented for the traveler. The trail passes through fourteen states. The main page provides general information on each state and links to user to information regarding the terrain, accommodations, services, and other information required to plan a trip along some part of the trail.

**Address:** <http://www.fred.net/kathy/at/atstate/html>

*August 11, 1995*

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**Sixth Annual ITS America Meeting**

April 15 - 18, 1996

George R. Brown Conference Center  
Houston, Texas

## **The International ITS Clearinghouse Fact Sheet #12**

### **Commuter and Intercity Passenger Rail Information on the World Wide Web**

The following entries represent a sample of the resources related to commuter rail and intercity passenger rail available on the World Wide Web. Some of these sites deal exclusively with rail maps and schedules; others incorporate information on rail technology and operations. Some of the web pages are maintained by the rail service provider; others are maintained outside organizations, sometimes on a volunteer basis. Please see Fact Sheet #10: Multimodal Transit Information on the WWW for listing on a number of related and overlapping sites.

These listings were accurate as of July 27, 1995. New pages may be added, old ones may move or disappear from the WWW.

#### **1. Amtrak Information on the World Wide Web**

Amtrak information is provided from two locations; on Amtrak's Homepage, and through the Cyberspace Railway. Amtrak's pages provide information on routes (no schedules), packages, sightseeing, and other information. The Amtrack Schedules page is a collaborative venture of The Railroad List (railroad@cunyvm.cuny.edu) provided by the Cyberspace Railway (listed below). The Amtrack Schedules page provides route and schedule information. Color maps available for the United States, and for regions of the United States.

**Address:** Amtrak Home Page <http://www.amtrak.com>

**Amtrak Routes/Schedules:** <http://www.mcs.net/~dsdawdy/Amtrak/amtrak.html>

#### **2. Alaska Railway Information**

This site contains information on rail services, as well as rail and cruise excursions in Alaska. Information is presented primarily for recreational travelers and tourists.

**Address:** <http://alaskan.com/akrail.html>

#### **3. Canadian Passenger Rail Services Home Page**

The Canadian Passenger Rail home page provides an index to timetables and operational and equipment descriptions for all passenger rail services in Canada. The contents of these pages were developed by rail enthusiasts and have not been authorized by the companies themselves.

The information provided is useful to commuters, as well as tourists and visitors to Canada. Information is organized by railway, province, regions, equipment types, and other categories. Some items of special note include the following: Information for Go-Transit (including information on handicapped access and equipment cycles); connections for travelers between the Via Trains and Prince Edward Island buses are described; and information on VIA rail in English and French.

**Address:** <http://www.mcs.net/~dsdawdy/Canpass/canpass.html>

**For Information:** Chris Roberts (aa633@cfn.cs.dal.ca)

#### **4. Chicago Metra Commuter Rail System**

The page includes general information on Metra, a Metra Fare Map, color route maps, and schedule information for Metra routes. The Cyberspace world Railroad (see listing below) has entered Metra schedules. All information has been entered and is maintained by the Cyberspace World Railroad (see listing below).

**Address:** <http://www.mcs.net/~dsdawdy/Schedule/schedule.html>

#### **5. Delaware Area Association of Rail Passengers**

This site maintains listing on a number of commuter and intercity rail services. These include: Northeast corridor commuter trains (including those in the Washington DC/Baltimore region, PATCO information, New Jersey Transit trains, DART service in Wilmington, Delaware, and information on going to New York City via SEPTA and NJT.

**Address:** <http://libertynet.org/~dvarp/schedule.html>

#### ***Rail Resources***

The following pages provide links to a wide range of rail oriented information including: international routes and schedules; technical information (i.e. equipment rosters, color schemes); and recreational and hobbyists information. A visit to the pages in this section virtually guarantees introduction to most of the rail-oriented WWW resources, including those addressing traveler information.

#### **5. Cyberspace World Railroad**

**Address:** <http://www.mcs.net/~dsdawdy/cyberoad.html>

**For Information:** Daniel S. Dawdy (dsdawdy@mcs.com)

#### **6. The Virtual Railroad**

**Address:** [http://gpu.srv.ualberta.ca/~ybeaudoi/Virtual\\_railroad/atlas.htm](http://gpu.srv.ualberta.ca/~ybeaudoi/Virtual_railroad/atlas.htm)

[http://www.ualberta.ca/~ybeaudoi/Virtual\\_railroad/home.htm](http://www.ualberta.ca/~ybeaudoi/Virtual_railroad/home.htm)

**For Information:** Yves Beaudoin (ybeaudoi@gpu.srv.ualberta.ca)

## **7. The European Railway Server**

**Address:** <http://mecurio.iet.unipi.it/home.html>

**For Information:**

### ***International Rail Timetables and Information***

**Australian Rail:** <http://www.monash.edu.au/ccstaff2/che/bromage/WWW/tt>  
<http://www.monash.edu.au/nfs/ccstaff2/ccstaff2/che/bromage/WWW/tt>

**Belgian Railways:** <http://www.win.twe.nl/win/cs/fm/laan/nmbs>

**Dutch Railways:** <http://mecurio.iet.unipi.it/nsinfo.html>

**Eurostar (Chunnel) Trains:** <http://www.iihe.ac.be/hep/pp/evrard/eurostar.html>

**Finnish Railways:** <http://www.hut.fi/~ovr/VR-e.html>

**German Railways:** <http://r2stud1.R2.uni-karlsruhe.de/~uie3>  
[http://www.bahn.de/index\\_e.html](http://www.bahn.de/index_e.html)

**Norwegian Railways:** <http://pc7kihino/timetable/index/html>

**Swedish Rail:** <http://www.dvcs.uu.se/%7Erolandb/SJ/index.html>

**Poland:** <http://www.oa.uj.edu.pl/warcrac.html>

### ***Related Fact Sheets:***

**Fact Sheet #9:** Traffic Information on the World Wide Web

**Fact Sheet #10:** Multimodal Transit Information on the World Wide Web

**Fact Sheet #11:** Traveler Services Information on the World Wide Web

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## **APPENDIX IV**

### *ITS Core Infrastructure*

1. ATMS/ATIS Infrastructure Summary Description
2. Model Deployment for National CVO Core Infrastructure

# **ATMS/ATIS Infrastructure Summary Description**

## **1. Introduction**

Many of the functions needed for Intelligent Transportation Systems (ITS) are already being provided or supported by a broad variety of core infrastructure systems or features, which can serve as the building blocks of a full ITS implementation. The core infrastructure refers to those portions of ITS-related hardware, software, services, etc. that today, and increasingly in the future, will manage and support the transportation-related activities in metropolitan areas. The core infrastructure is generally provided by the public sector, either alone or through partnership with the private sector. The private sector may build upon this core to provide additional, value-added services. The ATIS/ATMS core infrastructure is the basic set of hardware, software and related activities that support the functions of traffic management and control, transit management, incident management, fare/toll payment, and the provision of pre-trip and en-route traveler information. ITS involves applying current and evolving technology to transportation systems and the careful integration of system functions to provide efficient and effective solutions to multi-modal transportation problems. Benefits are derived both from the ability to upgrade system functions with new system components and technologies in a modular fashion and by increasing the level of integration and coordination of system functions and activities across jurisdictions, agencies, and the various core infrastructure systems.

Implementation of the core infrastructure features permits efficient operation and management of roadway and transit resources through the integration and use of currently available technologies and with strengthened institutional ties and inter-jurisdictional/interagency coordination. In the near-term, implementation of the core infrastructure features is expected to be led by the public sector, and development of new and/or enhanced capabilities is expected to occur in an evolutionary manner. However, private sector participation is highly encouraged, and appropriate partnership opportunities should be actively sought by State and local implementing agencies. Maturation of the core features in metropolitan areas can be expected to drive private sector development of new/advanced products and industries to provide future ITS user services.

## 2. ATIS/ATMS Core Features

### A. Overview

Seven separate ATIS/ATMS core infrastructure features, for metropolitan areas, are described in the following sections. The features are basic ITS capabilities which are currently available for deployment or are already in operation. These features represent the basic building blocks that will support the deployment of advanced ITS capabilities. It must be emphasized that while significant benefits are derived from the seven individual infrastructure features, even greater benefits can be shown when these features are integrated and operated in a coordinated fashion throughout the metropolitan area or region of interest. Benefits include, but are not limited to, transportation system operating efficiency, personal time savings and productivity increases, environmental (emissions reduction, etc.) and safety improvements. Other benefits will be derived in terms of implementation cost and accelerated deployment potential when open systems standards are applied and when modular systems approaches are followed in the implementation or enhancement of the core infrastructure. The core infrastructure features are defined as follows:

1. Multimodal Traveler Information System(s) (MTIS)
2. Traffic Signal Control System(s)
3. Freeway Management System(s)
4. Transit Management System(s)
5. Incident Management Program
6. Electronic Fare Payment System(s)
7. Electronic Toll Collection (ETC) System(s)

Core infrastructure features support the provision of ITS User Services as identified in the ITS Program Plan and related documents. However there is no direct one-to-one relationship between infrastructure features and the User Services discussed below. To address this issue the following descriptions will briefly discuss the basic functions performed by the infrastructure features (either separately or in combination) and the potential benefits provided. Infrastructure functions (or functional areas) include the following areas: traffic surveillance, information fusion, traffic signal control, variable message (fixed) signing or sign-post/beacon support for in-vehicle signing, fare payment and toll collection, as well as the provision of pre-trip and enroute traveler/driver information.

Each core infrastructure feature is further described in terms of target capabilities which are expected to be available and implemented within the next 15 years. Many of the additional ITS capabilities to be provided over this time frame will be achieved through the successful integration of specific infrastructure features and through the evolutionary upgrade of existing systems and subsystems. The ability to make modular upgrades and improvements to existing systems is critical to the overall success of ITS. Open standards and design modularity are expected to provide payoff in the future in terms of ease of upgrade and in minimizing upgrade or replacement costs. These infrastructure features will be enhanced and integrated within the overall framework provided by the ITS National Architecture as currently being defined.

## **B. ITS National Program Plan and the ITS User Services**

The National ITS Program Plan was published in early 1995 to serve as a guide for the "development and deployment of Intelligent Transportation Systems (ITS) in the United States." This plan identifies the numerous activities which must be accomplished to support the successful deployment of ITS. The plan provides an overall framework within which both the public and private sectors can work together as partners in this effort.

The plan also identifies a set of 29 user services (or capabilities) considered key to addressing surface transportation-related problems within our society. These user services are grouped into seven inter-related "bundles" each with a specific focus. They are identified below, along with the specific user services each comprises. The core infrastructure features are intended to support these user services through the deployment and integrated operation of enabling systems. Of the seven bundles, five are closely associated with the topic of this paper. The five user service bundles related to the ATIS/ATMS Core Infrastructure are highlighted below. In addition to the five service bundles, the user service Hazardous Materials Incident Response, under the CVO service bundle, is also highlighted because it is addressed (in part) through the ATIS/ATMS core infrastructure.

1. Travel and Transportation Management:
  - ▼ En-Route Driver Information,
  - ▼ Route Guidance,
  - ▼ Traveler Services Information.
2. Travel Demand Management:
  - ▼ Demand Management and Operations,
  - ▼ Pre-Trip Travel Information,
  - ▼ Ride Matching and Reservation.
3. Public Transportation Operations:
  - ▼ Public Transportation Management,
  - ▼ En-Route Transit Information,
  - ▼ Personalized Public Transit,
  - ▼ Public Travel Security.
4. Electronic Payment:
  - ▼ Electronic Payment Services.
5. Commercial Vehicle Operations:
  - ▼ Commercial Vehicle Electronic Clearance,
  - ▼ Automated Roadside Safety Inspection,
  - ▼ On-board Safety Monitoring,
  - ▼ Commercial Vehicle Administrative Processes,
  - ▼ Hazardous Materials Incident Response,
  - ▼ Freight Mobility.

6. Emergency Management:
  - ▼ Emergency Notification and Personal Security.
  - ▼ Emergency Vehicle Management.
7. Advanced Vehicle Control and Safety Systems:
  - ▼ Longitudinal Collision Avoidance,
  - ▼ Lateral Collision Avoidance,
  - ▼ Intersection Collision Avoidance,
  - ▼ Vision Enhancement for Crash Avoidance,
  - ▼ Safety Readiness,
  - ▼ Pre-Crash Restraint Deployment,
  - ▼ Automated Highway System.

While the elements of the core infrastructure may appear more closely associated with certain traffic control, public transportation, and emergency management services in the above list, every user service that is highlighted is dependent upon the core infrastructure in a significant manner. The following sections of this paper describe the ATIS/ATMS core infrastructure features, how these features (or their future enhancements) support the provision of user services, and the benefit areas (or mechanisms) that are anticipated. A more thorough description of ITS benefits can be found in the referenced paper (MITRE MP 95W0000192, June 1995, Donald L. Roberts and Dwight E. Shank).

### **C. Relationship to the ITS National Architecture.**

The National ITS Architecture program, currently in its second phase, is in the process of defining a National ITS Consensus Architecture. When this program is completed in mid-1996 it will provide additional guidance on how individual core infrastructure features should interact to perform necessary ITS functions. The architecture is considered a broad framework that identifies functions, subsystems, and data flows necessary to support the various ITS services. It is being defined to provide an overall structure within which the existing core infrastructure systems, subsystems, and future extensions, capabilities, and add-ons will operate. The architecture will provide the technical guidance needed to implement and integrate the various core infrastructure systems and features. It is national in scope, in that critical system elements, functions and interfaces are intended to operate and interact seamlessly throughout the country and potentially across international borders, with Canada and Mexico:

- ▼ Traffic Control,
- ▼ Incident Management,
- ▼ Emissions Testing and Mitigation.

### 3. Multimodal Traveler Information System(s) (MTIS)

#### A. MTIS Description

Metropolitan areas generally consist of multiple local jurisdictions and state level organizations each responsible for providing some level of traffic surveillance, management, and control. There is a need for a centralized source of roadway and transit information to provide a comprehensive and integrated view of the road and traffic conditions throughout the metropolitan area or region. Potential users of this information include both the end users; the travelers, traffic managers and transit operators, private sector transportation-intensive businesses; and the private sector value added resellers of the information and related traveler services.

The information repository may be either a centralized or an inter-connected set of data management facilities that directly receive roadway and transit information from the various roadway surveillance systems and other information sources, either public or private. The MTIS will have the capability to combine the data from the various sources, package the data in a variety of formats, and provide the information to the users through different distribution channels, such as telephone voice and data services, radio and TV broadcasts, kiosks, computer-based (e.g., Internet) services, etc. Various options exist for either public or private sector distribution of MTIS data.

The MTIS is considered a key feature of the core infrastructure in that it will be the focal point for information collection and dissemination. The information may be provided both directly to the public and to private sector Information Service Providers (ISPs) that will supplement it with additional information, features, and services, and market the enhanced service products. The MTIS will link data from the other core infrastructure features into a comprehensive regional information system, thereby facilitating the timely distribution of critical travel-related information to the traveler and transportation-related commercial users. MTISs do not currently exist, although the concept is currently being implemented under several ITS Operational Tests. Mechanisms for collecting the critical travel-related data from various sources, fusing those data into meaningful and usable information and disseminating that information to the end-user are being developed. This will result in a capability to provide travelers and other users with accurate and timely data regarding transit status and schedules as well as traffic, roadway, and other travel-related conditions.

#### B. MTIS Benefits

The MTIS will provide part of the mechanisms for the sharing of regional traveler and traffic related information among the transportation managers and the travelers/drivers who are the end users of this information. This process will permit the traveler to either adjust travel schedules or mode choice, in response to the information being provided. In addition, the MTIS will facilitate the sharing of information and coordination of traffic control and incident response actions both within jurisdictions and across neighboring jurisdictional boundaries in the metropolitan area. These capabilities will produce important benefits in the travel efficiency and safety areas.